NATIONAL GEOGRAPHIC

RESOURCE LIBRARY I ACTIVITY : 1 HR 40 MINS

Interactions Among Organisms in Ecosystems

Students build on their prior knowledge of ecosystems through a class discussion. Groups then engage with multiple resources to answer questions about the elk migration in the Greater Yellowstone Ecosystem. To close, students define the concept of cascading effects in an ecosystem to a peer.

GRADES

6, 7, 8

SUBJECTS

Biology, Ecology, Conservation, Geography

CONTENTS

3 Links, 2 Videos, 1 Resource, 3 PDFs

OVERVIEW

Students build on their prior knowledge of ecosystems through a class discussion. Groups then engage with multiple resources to answer questions about the elk migration in the Greater Yellowstone Ecosystem. To close, students define the concept of cascading effects in an ecosystem to a peer.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/interactions-among-organisms-ecosystems/

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DIRECTIONS

This activity is part of the Detours and Distractions: How Humans Impact Migration Patterns unit

I. Activate and build on students' prior knowledge about ecosystems.

- Read aloud and write on the board the following quotes from the *Ecosytem* encyclopedic entry.
    - "Every factor in an ecosystem depends on every other factor, either directly or indirectly."
    - "The whole surface of Earth is a series of connected ecosystems."
- Invite students to think-pair-share and come up with examples and ideas about what the quotes above mean. Then invite students to share with the class; record student responses to be displayed in the classroom.
- Use some of the following prompts to elicit students' prior knowledge about ecosystems:
    - *What is an ecosystem?*
    - *What are some living and nonliving components of an ecosystem?*
        - In the discussion, help students identify and distinguish between biotic vs. abiotic factors.
        - Biotic factors are living parts of an ecosystem, such as predators, plants, and bacteria.
        - Abiotic factors are nonliving parts of an ecosystem, such as wind, temperature, and elevation.
    - *What are some examples of ecosystems?* (deserts, your backyard, rainforest, Arctic tundra, the deep sea)
    - *How are things in ecosystems related?*
    - *What happens when you change one component of an ecosystem?* (Possible responses: Other components are impacted. There could be few or many wide-reaching effects causing the ecosystem to be greatly stressed or, in extreme cases, collapse).
- Distribute the *Ecosystem Illustration* handout to each student. Allow time for students to complete these individually, and for students to swap handouts with a peer to check and add to their work.

2. Introduce students to the Greater Yellowstone Ecosystem resources.

- Remind students that their final project will include an ecosystem map layer. Explain that this activity will help them understand how their assigned animal is connected to the ecosystem(s) in which it lives, using elk migration in Yellowstone National Park as an example.
- Distribute the *Elk Migration: Yellowstone Ecosystem Research Guide* to each student, and provide student groups with the following resources:

    - *Yellowstone's Great Migration* video
    - *Follow the Elk's Perilous Journey* interactive
    - *What Drives Yellowstone's Massive Elk Migrations?* article

- Encourage students to work with their groups to investigate the resources and complete Part 1 of the research guide.
- For the last few minutes or so of this step, invite volunteers to share their answers to the questions. Check for accuracy and supplement any missing information with the answer key.

3. Prepare students to diagram how changes in the ecosystem can have cascading effects.

- Write the definition of *cascading effects* where all students can see: a series of secondary changes that are triggered by the primary changes to a key species in an ecosystem.
- Illustrate the concept of cascading effects in an ecosystem by showing the *Wolves of Yellowstone* video.
- After the video, show the *Trophic Cascade Scenario* as an example of a cascading effects diagram.
- On Part 2 of the research guide, have students use their knowledge of the elk migration and cascading effects to diagram the following scenario:

    - *What would happen if the temperature got too hot for grass to grow where it normally does?* (If the temperature gets too hot, then grass may grow at a slow rate. This might mean that elk populations won't have an adequate supply of food to support their populations. Or grass won't grow where it normally does, meaning elk migration patterns may change.)

- Ask students to work with a partner and explain their ecosystem and their cascading effect diagram to each other. Invite volunteers to share their diagrams with the class. Collect the

research guides upon completion.

Tip

Step 1: Depending on students' prior knowledge, spend more time exploring the *Ecosystem* encyclopedic entry, if needed.

Modification

Step 1: To provide more context about what an ecosystem is, visit a local ecosystem first and have a similar discussion. This can include the school grounds, a surrounding neighborhood, or a nearby unique ecosystem, such as a forest, desert, mountain, lake, river, or ocean.

Modification

Step 2: To reduce the number of computers used to access resources or to enhance comprehension and literacy learning opportunities, consider facilitating the video and animation with the whole class and/or providing printed copies of the article.

Informal Assessment

Student responses on the *Elk Migration: Yellowstone Ecosystem Research Guide*, as well as their participation during class discussions, can be used to informally assess their understanding of ecosystem(s), abiotic and biotic factors in ecosystems, the main components of the Yellowstone National Park Ecosystem, and how migrating elk interact with the ecosystems they travel through. Students' peer explanations can be used to assess their ability to describe how changes in ecosystems can have cascading effects.

Extending the Learning

- Show students the *Who's in My Backyard?* or *Floodplains Ecosystem* infographics. Students could replicate this activity's discussion by working in pairs or groups, or as a homework assignment.
- Visit a local ecosystem and have a similar discussion. This can include the school grounds, a surrounding neighborhood, or a nearby unique ecosystem, such as a forest, desert, mountain, lake, river, or ocean.

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology
- Conservation

Geography

Learning Objectives

Students will:

- Understand how migrating elk interact with the ecosystems they travel through.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Research
- Self-directed learning

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
  - Life and Career Skills
    - Initiative and Self-Direction
- Critical Thinking Skills
  - Analyzing
  - Remembering

- Understanding
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)
  - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.SL.7.1:**
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
• **CCSS.ELA-LITERACY.SL.7.2:**
Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

NEXT GENERATION SCIENCE STANDARDS

• **Crosscutting Concept 1:**
Patterns
• **Crosscutting Concept 4:**
Systems and system models
• **Crosscutting Concept 7:**
Stability and change
• **Crosscutting Concepts: Cause and Effect:**
• **Disciplinary Core Ideas LS2: Ecosystems, Energy, and Dynamics:**
• **MS. Ecosystems: Interactions, Energy, and Dynamics:**
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
• **Performance Expectations: MS-LS2-2:**
MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
• **Science and Engineering Practice 1:**
Asking questions and defining problems

• **Science and Engineering Practice 8:**
Obtaining, evaluating, and communicating information

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Paper
- Writing utensils

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, 1 computer per pair, Monitor/screen, Speakers

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group learning
- Small-group learning
- Small-group work

BACKGROUND & VOCABULARY

Background Information

Ecosystems are geographic areas where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. The whole surface of the Earth is a series of interconnected ecosystems, and whether indirectly or directly, every component in an ecosystem relies on every other factor. From deserts to the Antarctic tundra to tidepools, there are many different kinds of ecosystems. Cascading effects in ecosystems are a series of secondary changes that are triggered by the primary changes to a key species

in an ecosystem. Understanding ecosystems, and how the components are interrelated, can aid in understanding how animal migration patterns are shaped by, and help shape, their ecosystems.

The Greater Yellowstone Ecosystem is one of the largest nearly intact temperate zone ecosystems on the planet. Yellowstone National Park is at the heart of this wider ecosystem, and serves as an ideal example of a complex ecosystem with many interacting factors and stakeholders. The ecosystem is diverse with biotic and abiotic factors that influence the ecosystem, such as hydrothermal vents, lakes, rivers, and iconic wildlife, like elk (who have a well-studied annual migration), wolves, bison, foxes, and many more. The human use of Yellowstone National Park for recreation and the surrounding areas for hunting, fishing, and development provide for a great case study of how humans impact animal migration.

Prior Knowledge

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Recommended Prior Activities

- Collision! Human Impacts on Animal Migration
- Create an Animal Migration Map
- Tracking Animal Migration
- Why and How Animals Migrate

Vocabulary

Term	Part of Speech	Definition
abiotic	*adjective*	characterized by the absence of life or living organisms
animal migration	*noun*	process where a community of animals leaves a habitat for part of the year or part of their lives, and moves to habitats that are more hospitable.
biotic	*adjective*	having to do with living or once-living organisms.
cascading effect	*noun*	series of secondary changes that are triggered by the primary changes to a key species in an ecosystem.
component	*noun*	part.
detour	*noun*	unplanned or temporary path.

Term	Part of Speech	Definition
distract	*verb*	to divert or draw attention away from something.
ecosystem	*noun*	community and interactions of living and nonliving things in an area.
growth rate	*noun*	measurement of how fast something increases in size during a particular period of time.
impact	*verb*	to influence or have an effect on something.
migration pattern	*noun*	predictable movements, in time and space, of a group of animals or people.
model	*noun*	image or impression of an object used to represent the object or system.
perilous	*adjective*	dangerous.
population	*noun*	total number of people or organisms in a particular area.
predator	*noun*	animal that hunts other animals for food.
prey	*noun*	animal that is hunted and eaten by other animals.
resource	*noun*	substances such as water, air, shelter, and food sources which are valuable in supporting life.
temperature	*noun*	degree of hotness or coldness measured by a thermometer with a numerical scale.
Yellowstone National Park	*noun*	large national park in the U.S. states of Wyoming, Idaho, and Montana.

For Further Exploration

Articles & Profiles

- National Park Service: Greater Yellowstone Ecosystem

Instructional Content

- National Geographic: Abiotic Factors Collection
- National Geographic: Biotic Factors Collection
- National Geographic: Ecosystems Collection

Maps

- Montana State University: What is the Greater Yellowstone Ecosystem?

Websites

- National Geographic: Resource Library: Animal Migration